Beijing Spirit Technology Development Co.,Ltd.

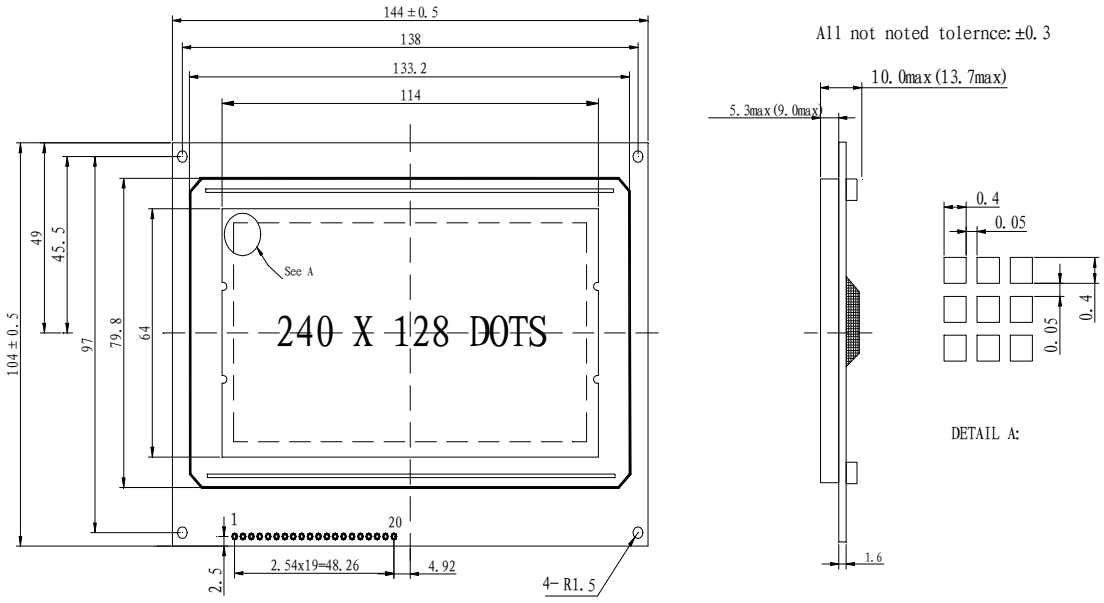
SPRT240128A User's Manual

1, Specification

1. Power:VDD:+5V±10%；own -10V negative pressure in module，it is used for LCD driver voltage;
2. Display Content: 240(line) × 128 (row) dot;
3. Whole screen dots;
4. Own 8K data memory (software set the address);
5. The interface match8080 series and Z80 series MPU control time order;
6. Driver Mode: 1/128 DUTY,1/9 BIAS;
7. Working Temperature: 10℃ ∽ +60℃; Store Temperature: -20℃ ∽ +70℃;
8. Own LED or EL backlight; backlight circuit≤100 mA
9. 6 O'CLOCK display;

2, Dimension Chart

Chart 1

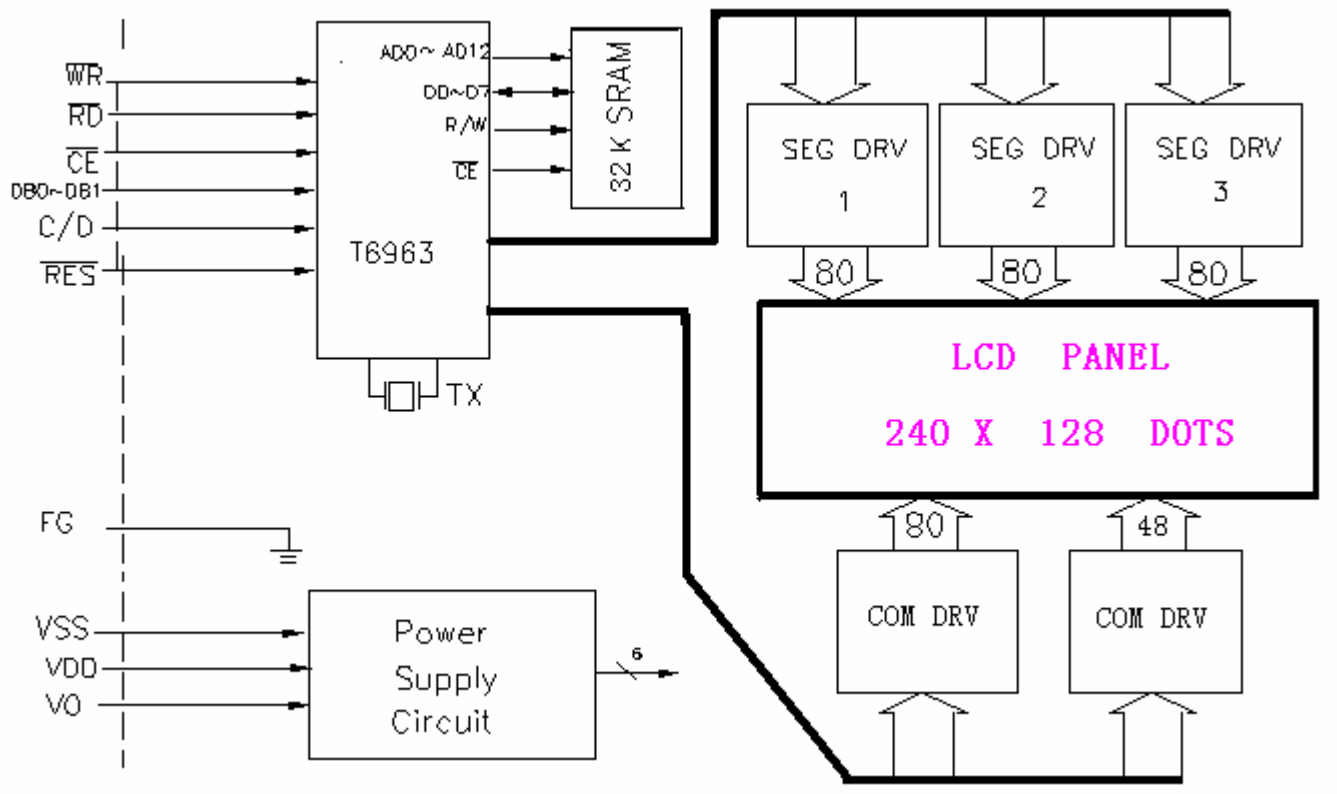


External Chart

Table 1

ITEM	NOMINAL DIMEN	UNIT
Module Volume	144.0×104.0×13.7	mm
Sight	114.0×64.0	mm
Line and row dots	240×128	DOTS
Dot Distance	0.40×0.40	mm
Dot Size	0.45×0.45	mm

3, Hardware Structure Chart



4, External Interface of Module

Signal of external interface, please refer to table 2

Table 2

Pin no	Symbol	Level	Function
1	FG	0V	Frame ground
2	Vss	0V	Ground
3	VDD	5.0V	Supply voltage for logic
4	V0	-	Operating voltage for LCD drive
5	/WR	L	Write signal
6	/RD	L	Read signal
7	/CE	L	Chip enable signal
8	C/D	H/L	H: Instruction code L: Data
9	/RESET	L	Reset signal
10	DB0	H/L	Data bit 0
11	DB1	H/L	Data bit 1
12	DB2	H/L	Data bit 2
13	DB3	H/L	Data bit 3
14	DB4	H/L	Data bit 4
15	DB5	H/L	Data bit 5
16	DB6	H/L	Data bit 6
17	DB7	H/L	Data bit 7
18	FS	H/L	Font select signal (H:5X8 dots; L:8X8 dots)
19	VOUT		
20	LED+	-	LED Backlight
21	LED-		LED Backlight

5, IC Explanation And Command Set

T6963C is LCD controller designed to be used for control LCD driver
LCD driver LSIs and display data Memory, It has an 8 bit parallel data bus
And control lines for reading or writing through a MPU I/F.

It has 128 words character generator ROM with the capability to control External display RAM of up to 128K bytes. Allocation of text, graphics And external generator RAM can be easily made and the display window can Be freely moved within the allocated memory range.

It supports a very board range of LCD formats by selecting different Combinations on a set of programmable inputs. It can be used in text, graphic Modes and has various attribute functions.

Command Set:

Table 2

COMMAND	CODE	D1	D2	FUNCTION
Register Set	00100001	X address	Y address	Cursor pointer set
	00100010	Data	00H	Off register
	00100100	Low address	High address	Address pointer set
Control Word set	01000000	Low address	High address	Text home address set
	01000001	Columns	00H	Text area set
	01000010	Low address	High address	Graphic home address set
	01000011	Columns	00H	Graphic area set
Mode set	1000x000	-	-	"OR" mode
	1000x001	-	-	"EXOR" mode
	1000x011	-	-	"AND" mode
	1000x100	-	-	"Text attribute" mode
	10000xxx	-	-	Internal CGROM mode
	10001xxx	-	-	External CGRAM mode
Display Mode	10010000	-	-	Display off
	1001xx10	-	-	Cursor on, blink off
	1001xx11	-	-	Cursor on, blink on
	100101xx	-	-	Text on, graphic off
	100110xx	-	-	Text off, graphic on
	100111xx	-	-	Text on, graphic on
Cursor Pattern Select	10100000	-	-	1 line cursor
	10100001	-	-	2 line cursor
	10100010	-	-	3 line cursor
	10100011	-	-	4 line cursor
	10100100	-	-	5 line cursor
	10100101	-	-	6 line cursor
	10100110	-	-	7 line cursor
	10100111	-	-	8 line cursor
Data auto Read/write	10110000	-	-	Data auto write set
	10110001	-	-	Data auto read set
	10110010	-	-	Auto reset
Data read Write	11000000	Data	-	Data write and ADP increment
	11000001	-	-	Data read and ADP increment
	11000010	Data	-	Data write and ADP decrement
	11000011	-	-	Data read and ADP decrement
	11000100	Data	-	Data write and ADP no variable
	11000101	-	-	Data read and ADP no variable
Screen peek	11100000	-	-	Screen peek
Screen copy	11101000	-	-	Screen copy
	11110XX	-	-	Bit reset

Bit Set/Reset	11111XXX	-	-	Bit set
	1111X000	-	-	Bit 0(LSB)
	1111X001	-	-	Bit 1
	1111X010	-	-	Bit 2
	1111X011	-	-	Bit 3
	1111X100	-	-	Bit 4
	1111X101	-	-	Bit 5
	1111X110	-	-	Bit 6
	1111X111	-	-	Bit 7(MSB)

6, Electric Parameter

1. ABSOLUTE MAXIMUM RATING

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage(logic)	VDD-VSS	-	-0.3	-	7	V
Supply Voltage(LCD Drive)	VDD-VO	-	VDD+0.3	-	VDD-0.3	V
Input Voltage	VI	-	-0.3	-	VDD+0.3	V
Operating Temperature	Topr	-	-10	-	+55	° C
Storage Temperature	Tstg	-	-20	-	+60	° C

2.OPTICAL DATA Ta=25°C

Item	Symbol	Condition		Standard Value			Unit
				min	typ	max	
Supply voltage(Logic)	VDD-VSS	-		4.75	5	5.25	V
Supply voltage(LCD Drive)	VDD-VO	-		-	-	-	V
Supply current	IDD	-		-	12.0	17.0	mA
	IO	-		-	1.8	2.5	mA
EL Backlight current	IEL	-		-	100	-	mA
Input high voltage	VIH	High level		0.7VDD	-	VDD	V
Input low voltage	VIL	Low level		0	-	0.3VDD	V
Supply voltage for LCD Drive (1/80 duty)	VDD-VO	Ta=0° C		14.2	14.5	14.8	V
		Ta=25° C		13.3	13.6	13.9	V
		Ta=50° C		12.3	12.6	12.9	V
Contrast Ratio	CR			-	4	-	-
Viewing Angle	-	CR≥2	θ	-10	-	20	deg
			θ	60	-	120	deg
Response Time (rise)	Tr	Note 1	Ta=25°	-	130	200	ms
Response Time (delay)	Td	Note 2	Ta=25°	-	150	230	ms

NOTE 1: Required time for blackening ratio of segment goes up from 0% to 90% when Wave from is switched from one selected one (θ=10°, φ=90°)

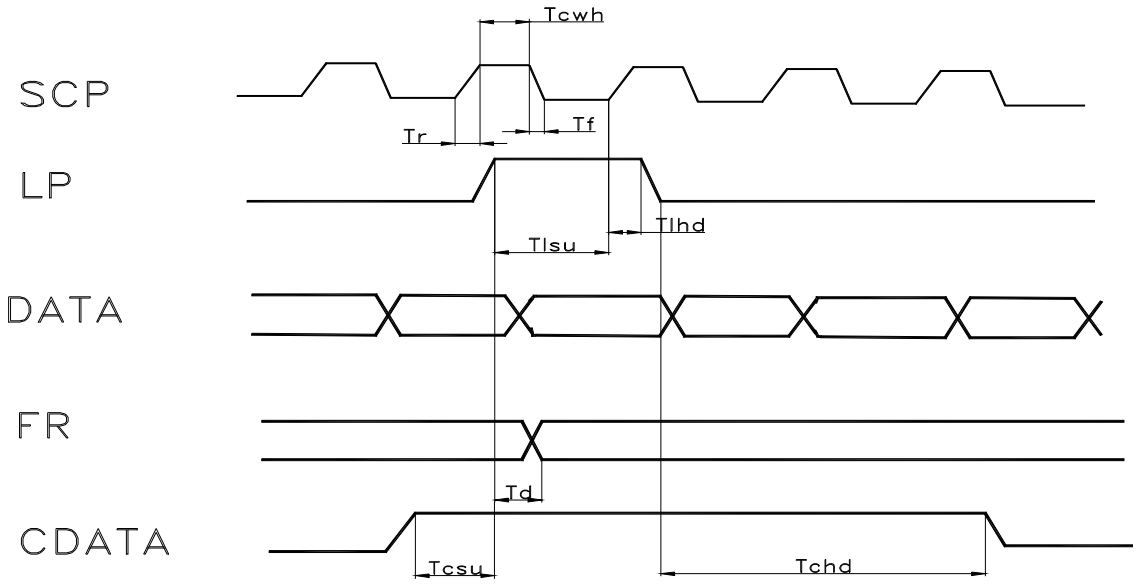
Note 2: Required time for blackening ratio of segment goes down from 100% to 10% When wave from is switched from one selected one (θ=10°, φ=90°)

3. TIMING CHARACTERISICS

Item	Symbol	Min	Max	Unit
Operating frequency	fSCP	-	2.75	MHZ

SCP pulse width	Tcwh, Tcwl	150		ns
SCP rise/fall time	Tr	-	30	ns
LP set up time	Tlsu	150	290	ns
LP hold time	Tlhd	5	40	ns
Data set up time	Tdsu	170	-	ns
Data hold time	Tdhd	80	-	ns
FR delay time	Td	0	90	ns
CDATA set up time	Tcsu	450	850	ns
CDATA hold time	Tchd	450	950	ns

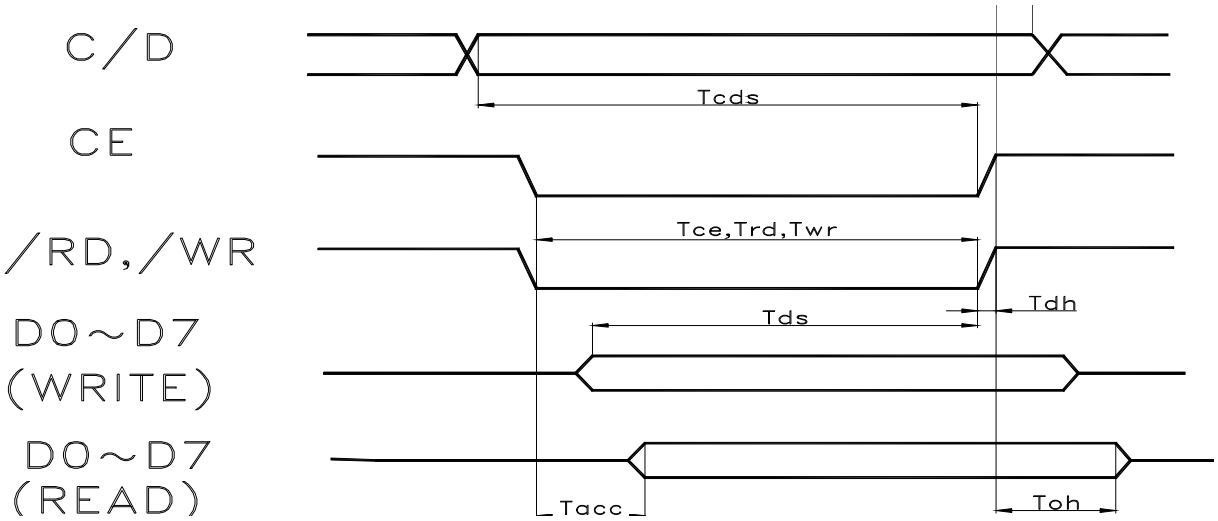
Condition: DV=+5.0V±10%, Ta=-10∽+70°C



Driver Wave Chart

4. INTERFACE TIMING

Item	Symbol	Min	Max	Unit
C/D set up time	Tcds	100	-	ns
C/D hold time	Tcdh	10	-	ns
CE,RD,WR pulse width	Tce,Trd,Twr	80	-	ns
DATA set up time	Tds	80	-	ns
DATA hold time	Tdh	40	-	ns
Access time	Tacc	-	150	ns
Output hold time	Toh	10	50	ns



Read And Write Time Order Chart

5. EL Backlight Electrical Characteristics

Ta=25°C VDD=5V

Symbol	Parameter	Min	Type	Max	Units
IIN	VDD supply current	10		150	mA
VA-B	Output voltage across lamp	37	40	43	V
		75	80	85	V
FEL	VA-B output drive frequency	600	800	1000	V
VDD	Supply voltage	4.5		12	V
CL	Load capacitance	0		25	nF
TA	Operating temperature	0		50	° C

Note: EL Backlight with white lamp.

7, Function Description

7.1 STATUS READ

Before sending data(read/write),command it is necessary to check the Status.

Status check

Status of T6963c can read from data lines.

/RD L
/WR H
/CE L
C/D H
D0∽D7 Status word

T6963C status word format is following

MSB							LSB
STA7	STA6	STA5	STA4	STA3	STA2	STA1	STA0
D7	D6	D5	D4	D3	D2	D1	D0

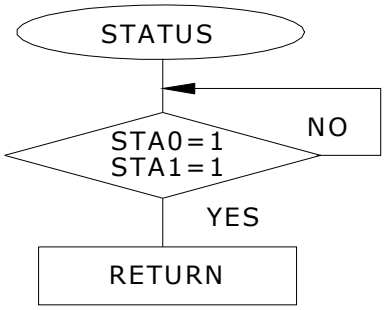
STA0	Check capability of command execution	0:Disable 1:Enable
STA1	Check capability of data read/write	0:Disable 1:Enable
STA2	Check capability of auto mode data read	0:Disable 1:Enable
STA3	Check capability of auto mode data write	0:Disable 1:Enable
STA4	Not use	
STA5	Check capability of controller operation	0:Disable 1:Enable
STA6	Error flag. Using screen peek/copy command	0:No error 1:error
STA7	Check the condition blink	0:Disable 1:Enable

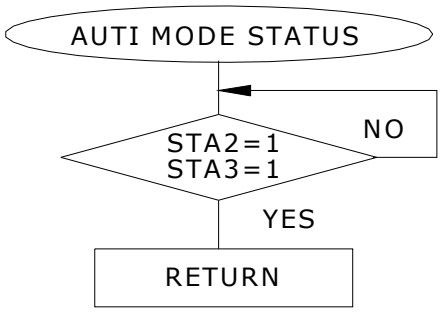
Note 1: It is necessary to check STA0 and STA1 at the same time, the error Is happened by sending data at executing command?

2: The status check will be enough to check STA0/STA1.

3: STA2/STA3 are valid in auto mode STA0/STA1 are invalid.

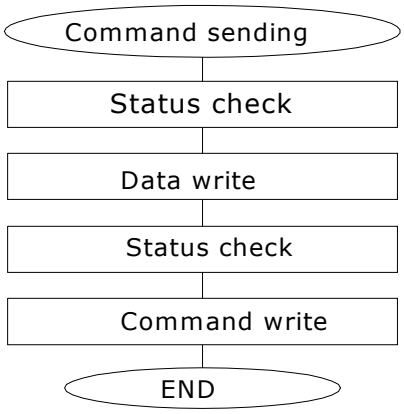
Status checking flow:

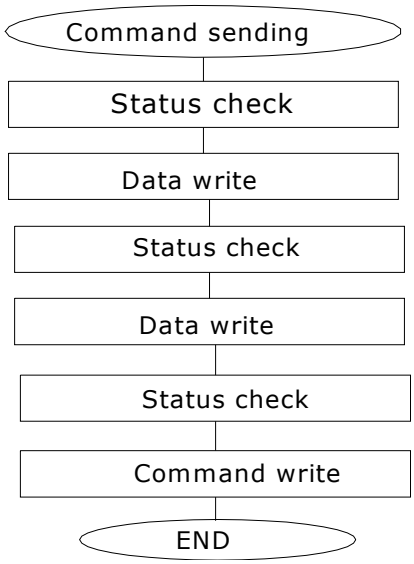




7.2 DATA SET

In T6963C,the data have been set and command executes.
The order of procedure of command sending





Note:In case of over 2 data sending,

valid).

7.31 Description of command

1. Register set

CODE	HEX	FUNCTION	D1	D2
00100001	21H	Cursor pointer set	X address	Y address
00100010	22H	Offset register set	Data	00H
00100100	24H	Address pointer set	Low address	High address

(1) Cursor pointer set

The position of cursor is specified by X address. The cursor position Is moved only by this command. The cursor pointer doesn't have the Function of increment and decrement. The shift of cursor set by this Command. X address, Y address are specified following.
X address 00H - - - - 4FH(Low 7bits are valid)
Y address 00H - - - - 1FH(Low 5bits are valid)
1 Screen drive
X address 00H - - - - 4FH
Y address 00H - - - - 0FH

(2) Offset register set

The offset register is used to determine external character generator RAM area.
T6963C has 16 bits address lines as follow:

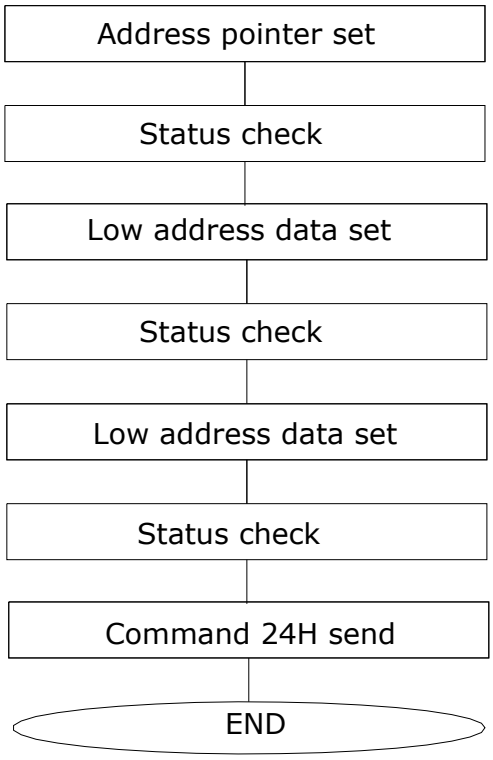
MSB LSB

Adl5	Adl4	Adl3	Adl2	Adl1	Adl0	Ad9	Ad8	Ad7	Ad6	Ad5	Ad4	Ad3	Ad2	Ad1	Ad0

The upper 5 bits (ad15 - ad11) are determined by offset register. The Middle 8 bits (ad10 - ad3) are determined by character code. The Lower 3 bit (ad2 - ad10) are determined by vertical counter. The Lower 5 bit of D1(data) are valid. The data format of external character Generator RAM.

(3) Address pointer set

The address pointer set command is used to indication the start address
For writing (or reading) to external RAM.
The flow chart address pointer set command



Address pointer set command send

7.32 Control word set

CODE	HEX	FUNCTION	D1	D2
01000000	40H	Text home address set	Low address	High address
01000001	41H	Text area set	Columns	00H
01000010	42H	Graphic home address set	Low address	High address
01000011	43H	Graphic area set	Columns	00H

The home address and column size are defined by this command

(1) Text home address and area set

The starting address of external display RAM for text display is
Defined by this command. The text home address shows the left end and
Most upper position .
The relationship of external display RAM address and display position
Example:
Text home address: 0000H
Text area: 00A0H
MD2=0, MD3=0: 80 COLUMN
DUAL=0, MDS=1, MD0=1, MD1=0: 28 LINES
Display plane:

0000H	0001H	- - - - -	004EH	004FH	1 Line
00A0H	00A1H	- - - - -	00EEH	00EFH	2 Line
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
10E0H	10E1H	- - - - -	112EH	112FH	28 Lines

(2) Graphic home address and area set

The starting address of external display RAM for Graphic display is Defined by this command. The graphic home address shows the left end most Upper line.

The relationship of external display RAM address and display position.

Example:

Graphic home address: 0000H

Graphic area: 0020H

MD2=H, MD3=H: 32 COLUMNS

DUAL=H, MDS=L, MD0=H, MD1=H: 2 LINES

Example:

Display plane:

0000H	0001H	- - - - -	001EH	001FH
0020H	0021H	- - - - -	003EH	003FH
:	:	:	:	:
01E0H	01E1H		01FEH	01FFH

7.33 MODE SET

The display mode is defined by this command. The display mode don't have to change until to send next this command. Logically "OR","EXOR","AND" of text and graphic display can be displayed.

When internal character generator mode is selected, character code 00H - 7FH are selected from built-in character generator ROM. The character code 80H-FFH are automatically selected external character generator RAM.

NOTE: Only text display is attributed, because attributed data is located.

Attribute function

"Reverse display", "Character blink" and "Inhibit" are called "Attribute". The attribute data is written in the graphic area defined by control word set command. The mode set command selects text display only and graphic the mode set command selects text display only and graphic display cannot be displayed. The attribute data of the 1ST character in text area

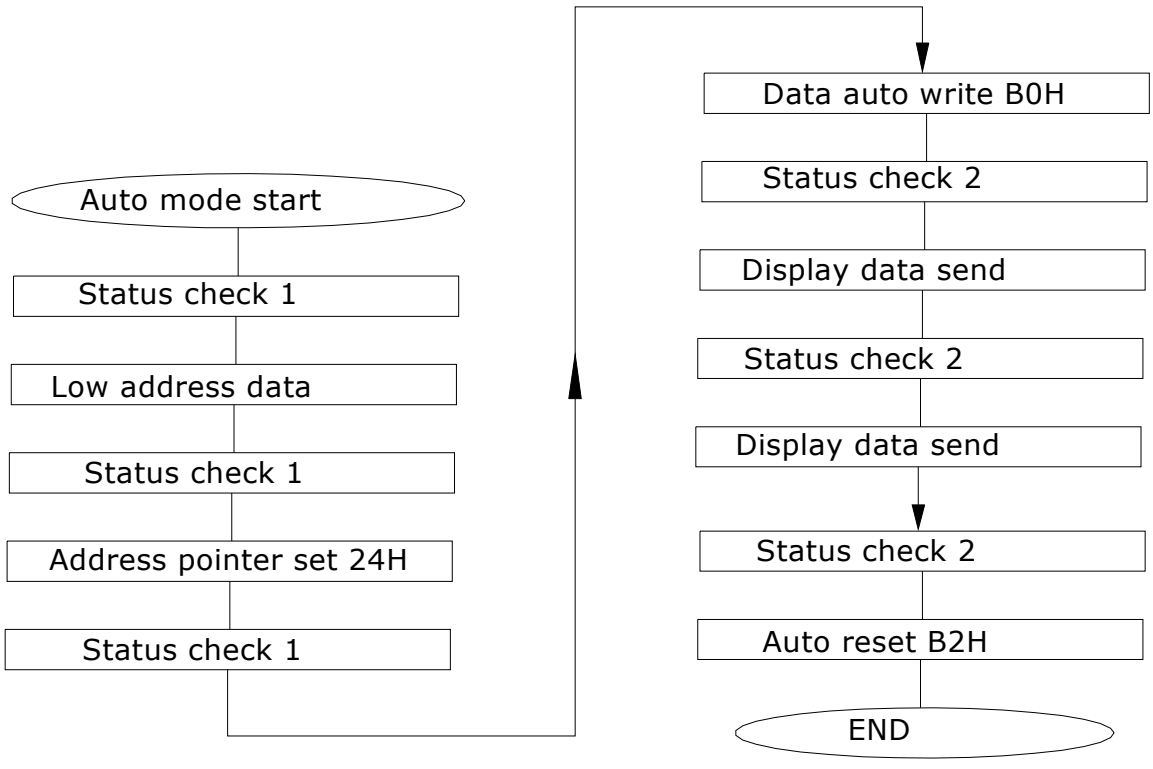
Is written at the IST 1 byte in graphic area, and attribute data of n-th 1byte in graphic area. Attribute function is defined as follow.

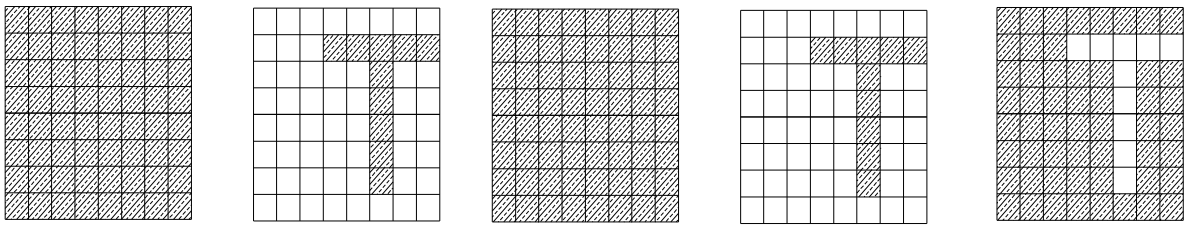
Attribute RAM 1byte

X	X	X	X	D3	D2	D1	D0

X: don't care

D3	D2	D1	D0	FUNCTION
0	0	0	0	Normal display
0	1	0	1	Reverse display
0	0	1	1	Inhibit display
1	0	0	0	Blink of normal display
1	1	0	0	Blink of reverse display
1	0	1	1	Blink of inhibit display





7.34 DATA AUTO READ/WRITE

CODE	HEX	FUNCTION	OPERAND
10110000	B0H	Data auto write set	-
10110001	B1H	Data auto read set	-
10110010	B2H	Auto reset	-

This command is convenient to send full screen data from external display RAM. After setting auto mode , "Data write(or read)" command is not necessary between each data. "Data auto write (or read)" command should follow the "Address pointer set" and address pointer is automatically increment by + 1 after each data. After sending (or receiving) all data

"Auto reset" is necessary to return normal operation because all data is regarded "Display data" and no command can be accepted in the auto mode.

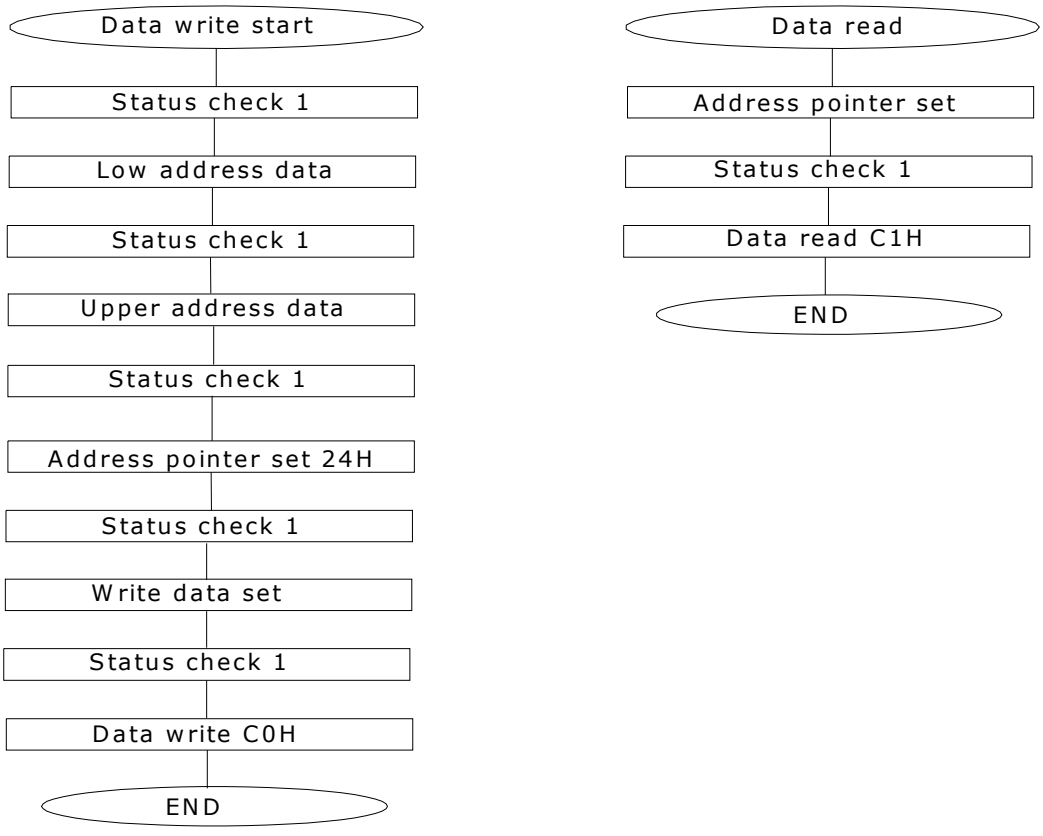
Note: status check for auto mode(STA2,STA3 should be checked between each
Data. Auto reset should be performed after checking (STA3=1 STA2=1)

7.35 DATA READ WRITE

CODE	HEX	FUNCTION	OPERAND
11000000	C0H	Data write and ADP increment	Data
11000001	C1H	Data read and ADP increment	Data
11000010	C2H	Data write and ADP decrement	Data
11000011	C3H	Data read and ADP decrement	Data
11000100	C4H	Data write and ADP non-variable	Data
11000101	C5H	Data read and ADP non-variable	Data

This command is used for data write from MPU to external display RAM, AND data read external display RAM to MPU. Data write/data read should be executed after setting address by address pointer set command. Address Pointer can be automatically increment by setting this command.

Note: this command is necessary for each 1 byte data.
Please refer following flow chart.



NOTE:

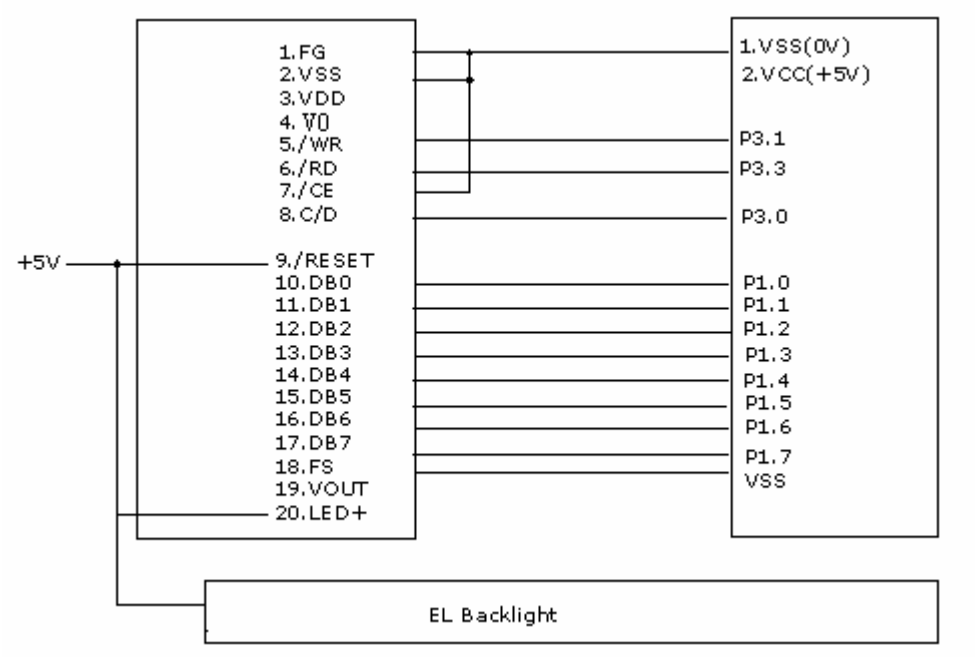
(1) After power on, it is necessary to reset. /RESET is kept "L" between 5 CLOCK up(oscillation clock).
(2) When /HALT has been "L", the oscillation is stopped. It is necessary To turn off power supply for LCD, because LCD goes down by DC bias.
(3) The HALF function contains the RESET function.
(4) After state of RESET/HALT.

TERMINAL	HALT	RESET
D0-D7	F	F
D0-d7	F	F
R/w	H	H
/ce	H (NOTE 1)	H (NOTE 1)
Ad0-ad15	H (NOTE 2)	H (NOTE 2)
/ce0,/ce1	H (NOTE 1)	H (NOTE 1)
ED,HOD	Final Data	Final Data
HSCP	L	L
LP	L	L
CDATA	H	H
FR	H	H
CH1	L	K0
CH2	L	VEND
DSPON	L	L
XO	H	OSC CLOCK

H: Level H
L: Level L
F: Floating (High impedance)
KO: Internal state (TEXT data access) normally open
VEND: End signal of V-counter(Line count) if MDS=H, T2=L, HEND (end signal of H-count) normally open.
Note 1: In Attribute mode, H or L by state of Graphic pointer.
Note 2: In Attribute mode, DATA of Graphic pointer.

8, Application

240128A connect SCM 8031, the interface chart as below :



Note: "V0" is the module driver voltage. This picture show that the module own negative pressure, if connect the external negative pressure, please connect 19 pin.

Program Case:

```
          ORG   0000H
          LJMP STAR
          ORG   0100H
STAR:
          MOV R4,#90H
          LCALL OUTIN    ;    display off

          MOV R2,#00H
          MOV R3,#00H    ;    TEXT HOME
          MOV R4,#40H
          LCALL OUTI2

          MOV R2,#30    ;
          MOV           R3,#00                    ;                    TEXT          AREA
&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
          MOV R4,#41H
          LCALL OUTI2

          MOV R2,#00H
          MOV R3,#10H
          MOV R4,#42H
          LCALL OUTI2    ;    GRAPHIC HOME

          MOV R2,#30
          MOV R3,#00H    ;GRAPHIC AREA
          MOV R4,#43H    ;
          LCALL OUTI2

          MOV R4,#94H    ; TEXT ON
          LCALL    OUTIN ; GRAPHIC OFF

          MOV R2,#00H
          MOV R3,#00H     ; TEXT WRITE "0"
          MOV R4,#24H
          LCALL OUTI2

          MOV R4,#0B0H
          LCALL OUTIN

          MOV R2,#01FH
CLRS0:
          MOV R3,#0FFH
```

```
CLRS1:
        CLR A
        LCALL OUTD
        DJNZ R3,CLRS1          ;blank
        DJNZ R2,CLRS0
        MOV R4,#0B2H
        LCALL OUTIN

      ; MODE SET

        MOV R4,#9cH
        LCALL OUTIN
        MOV R4,#80H      ; 84H txt character is error, please make the area of graphic change the
character code     &&&&&&&&&&&&&&&&&&&&&&&&&
        LCALL OUTIN

        MOV R2,#00H
        MOV R3,#00H
        MOV R4,#24H
        LCALL OUTI2

        MOV 12H,#10                    ;10 row 5~8 line *8 row
QW1: MOV R2,#30          ;30 characters per line
        MOV R3,#2CH        ;    Char code
        MOV 10H,#10H          ;10H is character code memory
        MOV R4,#0C0H
QW:    MOV R3,10H
        MOV R4,#0C0H
        LCALL OUTI1
        inc 10H

       DJNZ R2,QW
       DJNZ 12H,QW1
       LCALL TIME
       LCALL TIME

     ;~~~~~~~~~~~~~~~~~~~~~~~~That's txt construction.

        MOV        R4,#98H                    ;              text       off       graph       on
&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
        LCAll OUTIN
        MOV R0,#2
        MOV R1,#00H
        MOV R2,#00H
        MOV 22H,#30
SE:     MOV R3,#10H        ; DISPLAY    The graphic
        MOV R4,#24H
        LCALL OUTI2
        MOV
DPTR,#LDATA   ;&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
        LCALL LDIS1
        LCALL TIME
       LCALL TIME

       MOV 22H,#80                  ; winding up 80 rows
       MOV DPTR,#1000H

MOVE:   MOV R2,DPL
MOVES:   MOV R3,DPH
      MOV R4,#42H
      LCALL OUTI2

      MOV 21H,#0A0H
MOVES1:

LMS2:     MOV R6,#0AFH
LMS1:     DJNZ R6,LMS1

      DJNZ 21H,MOVES1
      MOV 25H,#1EH
MOVES2:INC DPTR
      DJNZ 25H,MOVES2
      DJNZ 22H,MOVE
      LCALL TIME
      LCALL TIME
      LCALL TIME


       LJMP STAR
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;-------------------------------------------------------------------------------------------
;*******************************************************************************************
**********

LDIS1:   NOP
         MOV R1,#160                ;送 160 行，为卷屏预送 80 行。
LDIS2:MOV R2,22H           ;30 COLOUMN
LDIS3:CLR A
      MOVC A,@A+DPTR
      MOV R3,A
      MOV R4,#0C0H
      LCALL OUTI1
      INC DPTR
      DJNZ R2,LDIS3
      DJNZ R1,LDIS2
      RET

;THIS SUBR. IS FOR DISPLAYING ONE LINE
;THE ENTRANCE PARA.

OUTI2:        LCALL  PR01                          ;THE ENTRANCE OF TWO BYTE PARA.
COMMAND
         MOV A,R2
         LCALL OUTD
;OUTI1 IS FOR ONE PARA.
OUTI1:        LCALL PR01
         MOV A,R3
         LCALL OUTD
;OUTIN IS FOR NO PARA.
OUTIN:        LCALL PR01
         MOV A,R4
         SJMP    OUTD1
;OUTD IS FOR DATA OUTPUT
OUTD:          CLR    P3.0                          ;FOR WRTIE DATA C/D=0
OUTD1:                                              ;FOR WRITE COMMAND C/D=0
         CLR    P3.1                          ;WR=0
         MOV    P1,A
         SETB P3.1                           ;W/R = 1
         SETB P3.0                           ;C/D =1
         RET

PR01:     LCALL PR0                  ;Check the state of the LCD Module
         JNB ACC.0,PR01                    ;JUDGE STA0
         JNB ACC.1,PR01                    ;JUDGE STA1
         RET
PR02:    LCALL PR0
         JNB    ACC.2,PR02                  ;FOR STA2
         RET
PR03:    LCALL PR0
         JNB    ACC.3,PR03                  ;FOR STA3
         RET
PR0:      ORL P3,#0BH                        ;C/D = 1
         ORL P1,#0FFH                       ;P1 PORT IS FOR INPUT
         CLR P3.3                           ;RD =0
         MOV A,P1
         SETB P3.3                          ;RD = 1
         RET

MS40:    MOV R7,#00FH
MS2:      MOV R6,#01FH
MS1:      DJNZ R6,MS1
         DJNZ R7,MS2
         RET

TIME:    MOV 23H,#03H
TIME1:    MOV 21H,#0FFH
TIME2:           LCALL MS40
      DJNZ 21H,TIME2
      DJNZ 23H,TIME1
      RET


_____________________________
LDATA:
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
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DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,002H,000H,004H,000H,000H,000H,000H,020H,010H,000H,002H,010H
DB 000H,000H,000H,042H,000H,040H,010H,010H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,002H,040H,004H,07fH,000H,000H,000H,020H,008H,060H,003H,010H
DB 007H,0ffH,03fH,0a3H,000H,0a0H,008H,008H,003H,0fcH,000H,000H,000H,000H
DB 000H,000H,000H,000H,004H,07fH,084H,002H,000H,000H,03fH,020H,00dH,09fH,006H,0ffH
DB 084H,021H,011H,012H,001H,010H,009H,0ffH,082H,004H,000H,000H,000H,000H
DB 000H,000H,000H,000H,004H,081H,004H,004H,000H,000H,001H,07fH,089H,011H,004H,010H
DB 004H,021H,011H,014H,002H,008H,002H,048H,003H,0fcH,000H,000H,000H,000H
DB 000H,000H,000H,000H,00dH,010H,03fH,008H,000H,000H,021H,041H,001H,011H,00dH,0ffH
DB 004H,021H,01fH,0ffH,084H,006H,022H,048H,002H,004H,000H,000H,000H,000H
DB 000H,000H,000H,000H,00cH,094H,009H,008H,000H,000H,012H,092H,001H,011H,019H,011H
DB 007H,0ffH,011H,008H,008H,00bH,094H,09fH,003H,0fcH,000H,000H,000H,000H
DB 000H,000H,000H,000H,014H,092H,009H,008H,000H,000H,00aH,010H,039H,011H,029H,011H
DB 004H,021H,011H,008H,037H,0fdH,014H,091H,002H,004H,000H,000H,000H,000H
DB 000H,000H,000H,000H,025H,011H,009H,0ffH,080H,000H,004H,010H,009H,011H,009H,0ffH
DB 004H,021H,01fH,008H,000H,000H,005H,0aaH,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,004H,051H,011H,008H,000H,000H,006H,010H,009H,051H,009H,011H
DB 004H,021H,011H,0ffH,080H,000H,00aH,0e6H,01fH,09fH,080H,000H,000H,000H
DB 000H,000H,000H,000H,004H,020H,019H,008H,000H,000H,006H,018H,009H,095H,008H,090H
DB 007H,0ffH,011H,008H,007H,0fcH,008H,094H,010H,090H,080H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,006H,008H,000H,000H,009H,028H,009H,012H,008H,060H
DB 004H,021H,013H,088H,004H,004H,038H,088H,01fH,09fH,080H,000H,000H,000H
DB 000H,000H,000H,000H,00aH,041H,002H,008H,00cH,000H,009H,024H,008H,010H,008H,020H
DB 004H,021H,03dH,008H,004H,004H,008H,08cH,010H,090H,080H,000H,000H,000H
DB 000H,000H,000H,000H,00aH,024H,085H,008H,00cH,000H,010H,046H,008H,010H,008H,05cH
DB 008H,021H,011H,014H,004H,004H,008H,094H,010H,090H,080H,000H,000H,000H
DB 000H,000H,000H,000H,01aH,004H,089H,088H,004H,000H,021H,083H,094H,000H,008H,087H
DB 088H,021H,001H,012H,007H,0fcH,008H,0a2H,01fH,09fH,080H,000H,000H,000H
DB 000H,000H,000H,000H,001H,0fcH,011H,028H,008H,000H,00eH,001H,023H,0ffH,08bH,001H
DB 010H,025H,001H,021H,084H,004H,008H,0c3H,090H,090H,080H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,020H,010H,000H,000H,000H,000H,000H,000H,000H,000H
DB 020H,022H,001H,041H,000H,000H,008H,081H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,010H,000H,000H,000H,042H,000H,040H,000H,040H,000H
DB 000H,000H,040H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,009H,0ffH,084H,081H,03fH,0a3H,000H,0a0H,000H,040H,00fH
DB 0fcH,000H,040H,03eH,0feH,001H,010H,00fH,0ffH,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,009H,001H,004H,091H,011H,012H,001H,010H,000H,040H,000H
DB 008H,01fH,0ffH,0a4H,082H,001H,090H,000H,001H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,048H,004H,091H,011H,014H,002H,008H,00fH,0feH,000H
DB 010H,000H,080H,024H,0feH,001H,010H,000H,001H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,020H,046H,03fH,091H,01fH,0ffH,084H,006H,008H,042H,000H
DB 020H,001H,000H,028H,082H,002H,008H,01fH,0f9H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,015H,082H,004H,091H,011H,008H,008H,00bH,088H,042H,000H
DB 040H,003H,0fcH,028H,082H,002H,004H,000H,001H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,014H,010H,004H,091H,011H,008H,037H,0fdH,00fH,0feH,000H
DB 040H,006H,004H,024H,0feH,004H,006H,000H,001H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,004H,010H,004H,091H,01fH,008H,000H,000H,008H,042H,000H
DB 041H,00aH,004H,022H,0a0H,008H,083H,08fH,0f1H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,009H,0ffH,004H,091H,011H,0ffH,080H,000H,008H,042H,03fH
DB 0ffH,093H,0fcH,022H,092H,010H,0c1H,008H,011H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,008H,010H,004H,091H,011H,008H,007H,0fcH,008H,042H,000H
DB 040H,022H,004H,02aH,094H,000H,080H,008H,011H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,030H,038H,00eH,091H,013H,088H,004H,004H,00fH,0feH,000H
DB 040H,002H,004H,024H,088H,001H,008H,00fH,0f1H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,010H,056H,031H,011H,03dH,008H,004H,004H,008H,042H,000H
DB 040H,003H,0fcH,020H,088H,002H,004H,008H,011H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,011H,093H,081H,011H,011H,014H,004H,004H,000H,040H,080H
DB 040H,002H,004H,020H,084H,004H,07eH,008H,001H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,016H,011H,002H,001H,001H,012H,007H,0fcH,000H,040H,080H
DB 040H,002H,024H,020H,0a3H,08fH,0c6H,000H,005H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,010H,010H,004H,001H,001H,021H,084H,004H,000H,03fH,081H
DB 040H,002H,01cH,020H,0c1H,004H,004H,000H,002H,000H,000H,000H,000H,000H
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DB 000H,000H,000H,000H,000H,010H,010H,000H,000H,001H,041H,000H,000H,000H,000H,000H
DB 080H,002H,008H,020H,080H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,008H,07fH,010H,008H,000H,020H,002H
DB 000H,00fH,03fH,001H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,004H,041H,00cH,00aH,004H,020H,002H
DB 040H,009H,021H,001H,0fcH,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,004H,07fH,008H,009H,003H,020H,004H
DB 07fH,089H,021H,003H,004H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,03fH,041H,003H,0ffH,081H,021H,004H
DB 081H,009H,025H,005H,008H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,07fH,001H,008H,01fH,0ffH,08dH
DB 010H,00fH,022H,018H,090H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,022H,020H,039H,008H,000H,041H,00cH
DB 094H,009H,020H,020H,060H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,012H,03fH,089H,009H,000H,041H,014H
DB 092H,009H,03fH,001H,098H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,014H,048H,089H,0e9H,080H,061H,025H
DB 011H,00fH,031H,006H,047H,080H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,014H,088H,089H,025H,000H,051H,004H
DB 051H,009H,031H,018H,041H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,015H,014H,089H,025H,000H,089H,004H
DB 020H,009H,02aH,007H,0fcH,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,006H,0a2H,089H,026H,000H,089H,000H
DB 000H,009H,02aH,000H,084H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,038H,080H,08bH,024H,081H,001H,00aH
DB 041H,009H,024H,000H,084H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,0feH,08dH,02aH,082H,011H,00aH
DB 024H,091H,02aH,001H,004H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,08aH,0b1H,084H,00aH,01aH
DB 004H,095H,033H,082H,004H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,005H,002H,040H,088H,004H,001H
DB 0fcH,022H,021H,00cH,014H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,002H,004H,000H,000H,000H,000H
DB 000H,000H,000H,030H,008H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000
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DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H,000H
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